Address Resolution Alternatives for HIPPI-6400 Networks

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1. Preconfigured Tables

A. Method:

- all hosts keep full, static tables which map IPv4 addresses to ULAs for all nodes attached to the HIPPI-6400 network

B. Advantages:

- exactly like legacy HIPPI-800

- no out-of-band address resolution protocol necessary

- deterministic answers to all address lookups

C. Disadvantages:

- administrative burden to maintain preconfigured tables on all hosts

- problematic (if not impossible) with dynamic host<->switch ULA negotiation

2. Classical ARP (RFC 826) w/Broadcast Server

A. Method:

- a single broadcast server enables 'ff-ff-ff-ff-ff-ff' (all-1's) as a ULA via an admin micropacket to the switch

- hosts on the HIPPI-6400 network send ARP requests to the all-1's destination ULA as in classical ARP (RFC 826)

- the broadcast server repeats the ARP broadcast to all hosts on the HIPPI-6400 network - one at a time

B. Advantages:

- no preconfigured tables necessary in hosts; no administrative burden

- hosts run classical ARP implementations with no modifications

C. Disadvantages:

- single point of failure

- preconfigured table needed on broadcast server; problematic with dynamic ULA negotiation

- unacceptable resource contention

- bad idea!

3. Third-Party ARP Agent(s) (RFC 1374)

A. Method:

- one or more hosts become ARP Agents by enabling unique, "well-known" ULAs via admin micropackets to the switch

- clients send ARP requests to "well known" ULAs

- ARP agents:

- cache IPv4<->ULA mappings gleaned from client ARP requests

- issue replies for ARP requests they can satisfy

- disregard ARP requests they cannot satisfy

B. Advantages:

- fault tolerance and reduced resource contention through multiple ARP agents

- no preconfigured tables on clients; no administrative burden

C. Disadvantages:

- poor cache hit rates in early lifetime of ARP agents (i.e. clients unable to resolve addresses)

- preloading agent caches might help, but problematic with dynamic ULA negotiation

- requires means of deterministically obtaining "well known" ULA assignments from the switch

4. NBMA Next Hop Resolution Protocol (NHRP) (draft-ietf-rolc-nhrp-10.txt)

A. Background:

- NBMA == Non-Broadcast, Multiple Access link layer

- work-in-progress in Internetworking Over NBMA (ION) IETF working group

- generic to any non-broadcast, multiple access link layer (not specific to ATM, SMDS, X.25, etc.)

- functional superset of RFC 1735

B. Method:

- Next Hop Servers (NHSs) serve a set of destination hosts on the NBMA

- hosts "register" their IPv6<->ULA mapping with their respective NHSs

- NHRP Clients (NHCs) send NHRP resolution requests to their NHSs

- NHSs:

- send "authoritative" NHRP resolution replies for hosts they serve

- forward requests to other NHSs for hosts they do not serve

- cache "non-authoritative" address resolution information for hosts they do not serve, and use it in "non-authoritative" replies

C. Advantages:

- same advantages as for Third-party ARP

- host registration and server<->server negotiation capabilities provide improved server cache hit ratio; higher address resolution success ratio

- "authoritative" and "non-authoritative" responses provide flexibility; improved performance through redundancy

- emerging standard combines experience of numerous earlier works on address resolution for NBMA networks

- "reference implementations" of NHRP beginning to emerge

D. Disadvantages:

- like Third-party ARP, still requires means of deterministically obtaining "well known" ULA assignments for NHSs from HIPPI-6400 switch

- provides superset of functionality actually needed for HIPPI-6400 (e.g. allows discovery of egress routers from the NBMA)

E. Futures:

- NHRP draft document on track to become RFC

- draft document for IPv6 over NBMA Networks already written

E. URL's:

- ION working group charter:

  http://www.ietf.org/html.charters/ion-charter.html

- ION Mailing List Archive

  http://netlab.ucs.indiana.edu/hypermail/ion/

- ION document repository FTP area:

  ftp://ftp.nexen.com/pub/ion/